

PS2802-1, PS2802-4

R08DS0156EJ0101

Rev.1.01

HIGH ISOLATION VOLTAGE DARLINGTON TRANSISTOR TYPE SSOP PHOTOCOUPLER

Feb 25, 2020

DESCRIPTION

The PS2802-1 and PS2802-4 are optically coupled isolators containing a GaAs light emitting diode and an NPN silicon darlington-connected photo transistor in a plastic SSOP for high density applications.

This package has shield effect to cut off ambient light.

FEATURES

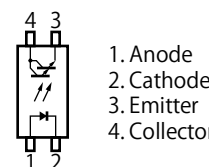
- High isolation voltage ($BV = 2\,500\text{ V r.m.s.}$)
- Small and thin package (4, 16-pin SSOP, Pin pitch 1.27 mm)
- High current transfer ratio ($CTR = 2\,000\%$ TYP. @ $I_F = 1\text{ mA}$, $V_{CE} = 2\text{ V}$)
- Ordering number of tape product: PS2802-1-F3, PS280C-4-F3
- Pb-Free product
- Safety standards
 - UL approved: UL1577, Single protection
 - CSA approved: CAN/CSA-C22.2 No. 62368-1, Basic insulation
 - BSI approved: BS EN 62368-1, Basic/Supplementary insulation
 - VDE approved: DIN EN 60747-5-5 (Option)

APPLICATIONS

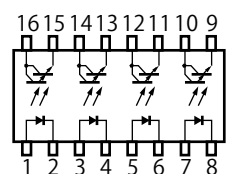
- Programmable logic controllers
- Measuring instruments
- Power supply
- Hybrid IC

PIN CONNECTION (Top View)

PS2802-1

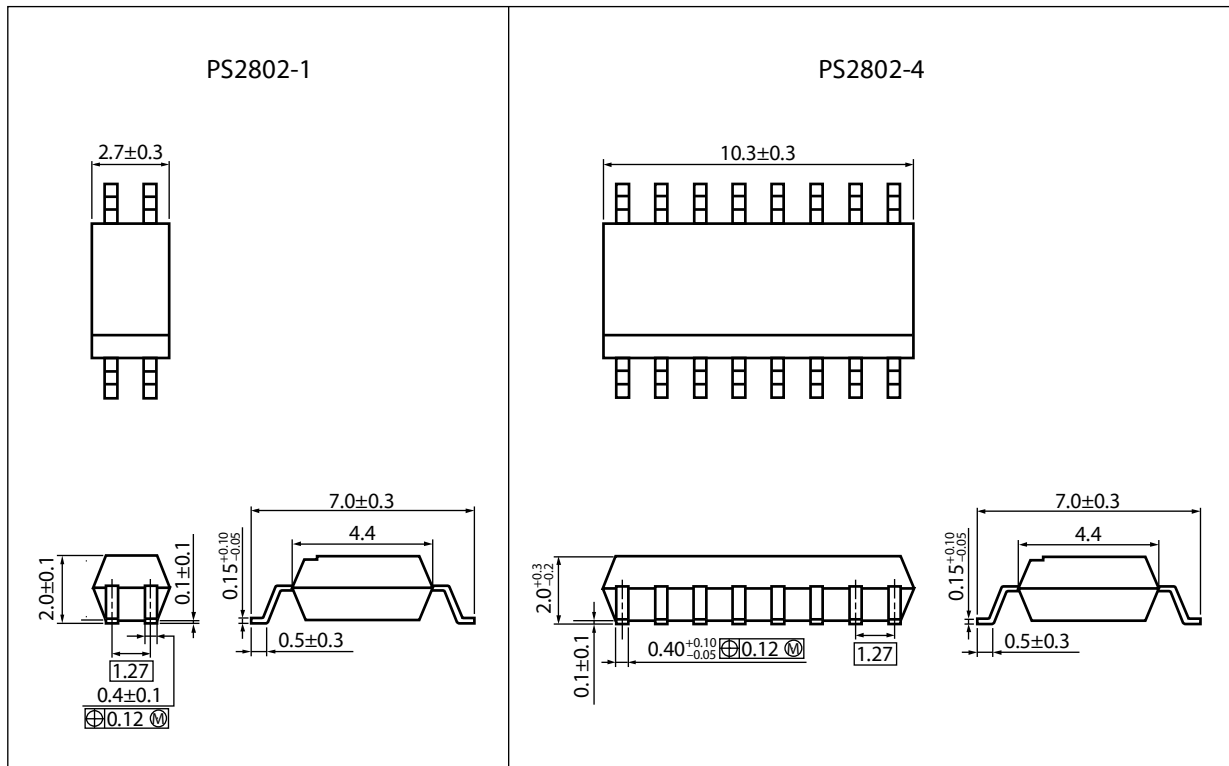


PS2802-4



1. 3. 5. 7. Anode
2. 4. 6. 8. Cathode
9. 11. 13. 15. Emitter
10. 12. 14. 16. Collector

PACKAGE DIMENSIONS (UNIT: mm)



Weight (4-pin SSOP) : 0.05 g (typ.)

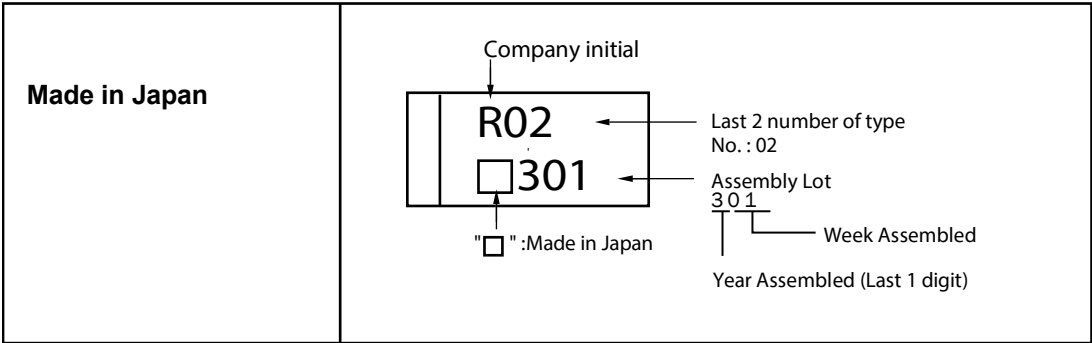
Weight (16-pin SSOP) : 0.2 g (typ.)

PHOTOCOUPLER CONSTRUCTION

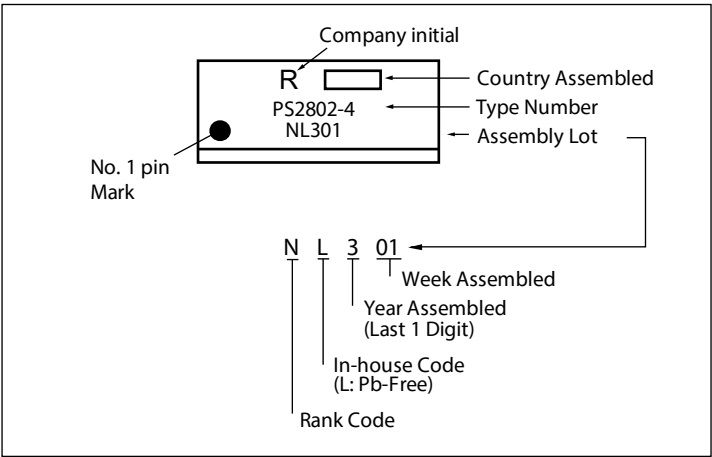
Parameter	Unit (MIN.)
Air Distance	4.5 mm
Creepage Distance	4.5 mm
Isolation Distance	0.1 mm

MARKING EXAMPLE

PS2802-1



PS2802-4



ORDERING INFORMATION

Part Number	Order Number	Solder Plating Specification	Packing Style	Safety Standard Approval	Application Part Number*1
PS2802-1	PS2802-1-A	Pb-Free	50 pcs (Tape 50 pcs cut)	Standard products (UL, CSA, BSI approved)	PS2802-1
PS2802-1-F3	PS2802-1-F3-A		Embossed Tape 3 500 pcs/reel		
PS2802-1-V	PS2802-1-V-A		50 pcs (Tape 50 pcs cut)	UL, CSA, BSI, DIN EN 60747-5-5 approved	
PS2802-1-V-F3	PS2802-1-V-F3-A		Embossed Tape 3 500 pcs/reel		
PS2802-4	PS2802-4-A		10 pcs (Tape 10 pcs cut)	Standard products (UL, CSA, BSI, approved)	PS2802-4
PS2802-4-F3	PS2802-4-F3-A		Embossed Tape 2 500 pcs/reel		
PS2802-4-V	PS2802-4-V-A		10 pcs (Tape 10 pcs cut)	UL, CSA, BSI, DIN EN 60747-5-5 approved	
PS2802-4-V-F3	PS2802-4-V-F3-A		Embossed Tape 2 500 pcs/reel		

Note: *1. For the application of the Safety Standard, following part number should be used.

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

Parameter		Symbol	Ratings		Unit
			PS2802-1	PS2802-4	
Diode	Forward Current (DC)	I_F	50		mA/ch
	Reverse Voltage	V_R	6		V
	Power Dissipation Derating	$\Delta P_D/^\circ\text{C}$	0.6	0.8	mW/ $^\circ\text{C}$
	Power Dissipation	P_D	60	80	mW/ch
	Peak Forward Current ^{*1}	I_{FP}	1		A/ch
Transistor	Collector to Emitter Voltage	V_{CEO}	40		V
	Emitter to Collector Voltage	V_{ECO}	6		V
	Collector Current	I_C	90	100	mA/ch
	Power Dissipation Derating	$\Delta P_C/^\circ\text{C}$	1.2		mW/ $^\circ\text{C}$
	Power Dissipation	P_C	120		mW/ch
Isolation Voltage ^{*2}		BV	2 500		Vr.m.s.
Operating Ambient Temperature		T_A	-55 to +100		$^\circ\text{C}$
Storage Temperature		T_{stg}	-55 to +150		$^\circ\text{C}$

Notes: *1. $PW = 100 \mu\text{s}$, Duty Cycle = 1%

*2. AC voltage for 1 minute at $T_A = 25^\circ\text{C}$, RH = 60% between input and output.

Pins 1-2 shorted together, 3-4 shorted together (PS2802-1).

Pins 1-8 shorted together, 9-16 shorted together (PS2802-4).

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Diode	Forward Voltage	V _F	I _F = 5 mA		1.1	1.4	V
	Reverse Current	I _R	V _R = 5 V			5	μA
	Terminal Capacitance	C _i	V = 0 V, f = 1.0 MHz		15		pF
Transistor	Collector to Emitter Dark Current	I _{CEO}	V _{CE} = 40 V, I _F = 0 mA			400	nA
Coupled	Current Transfer Ratio (I _{C/I_F}) ^{*1}	CTR	I _F = 1 mA, V _{CE} = 2 V	200	2 000		%
	Collector Saturation Voltage	V _{CE(sat)}	I _F = 1 mA, I _C = 2 mA			1.0	V
	Isolation Resistance	R _{I-O}	V _{I-O} = 1.0 kV _{DC}	10 ¹¹			Ω
	Isolation Capacitance	C _{I-O}	V = 0 V, f = 1.0 MHz		0.4		pF
	Rise Time ^{*2}	t _r	V _{CC} = 5 V, I _C = 2 mA, R _L = 100 Ω		200		μs
	Fall Time ^{*2}	t _f			200		

Notes: *1. CTR rank (PS2802-1 only)

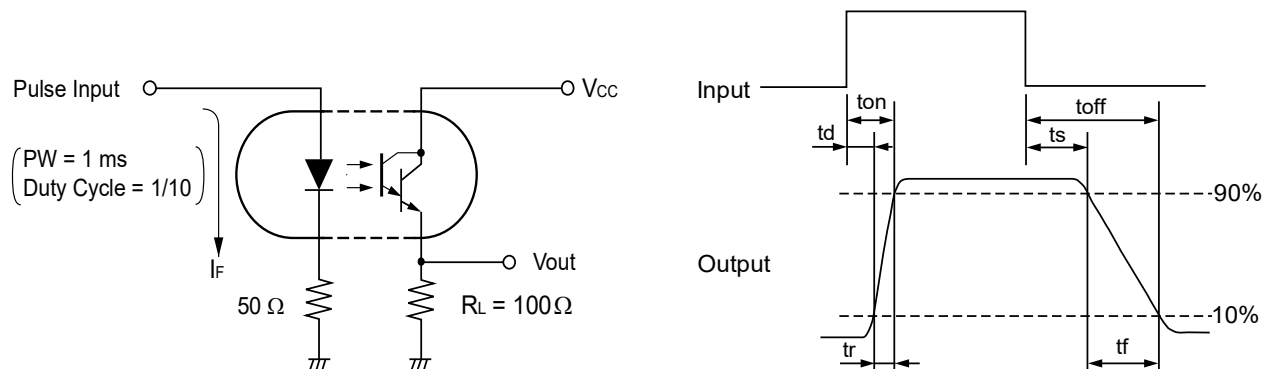
K : 2 000 to (%)

L : 700 to 3 400 (%)

M : 200 to 1 000 (%)

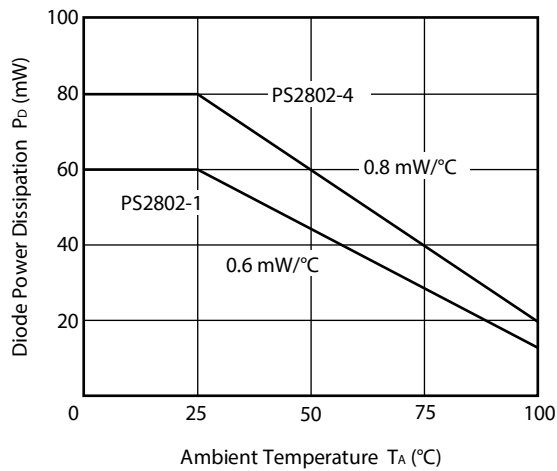
N : 200 to (%)

*2. Test circuit for switching time

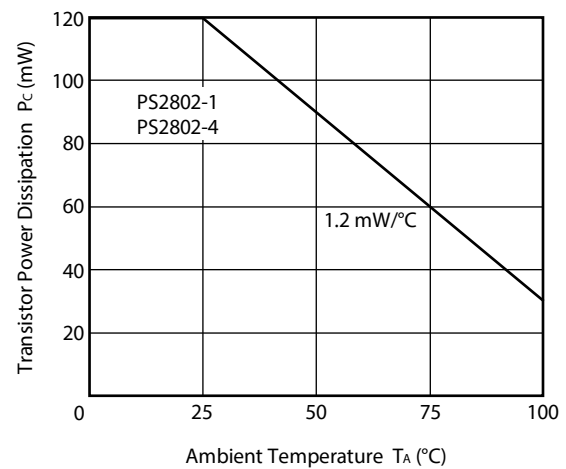


TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

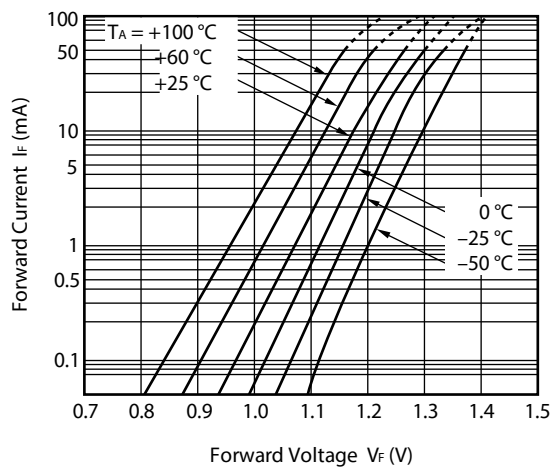
DIODE POWER DISSIPATION vs.
AMBIENT TEMPERATURE



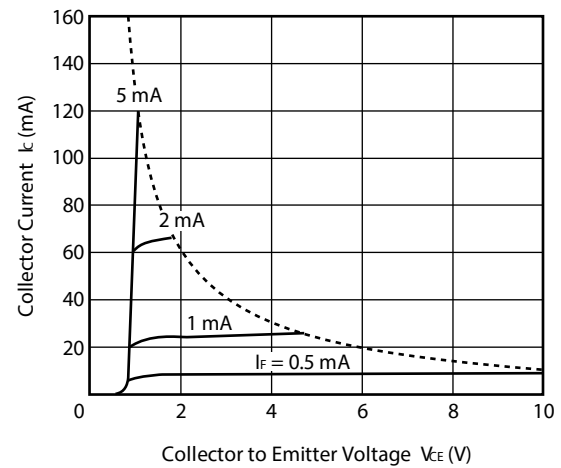
TRANSISTOR POWER DISSIPATION
vs. AMBIENT TEMPERATURE



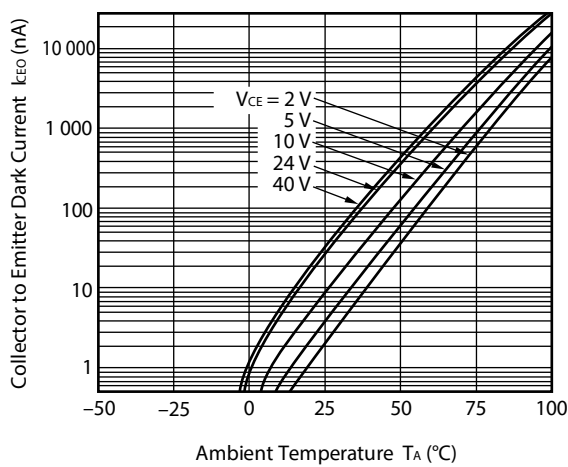
FORWARD CURRENT vs.
FORWARD VOLTAGE



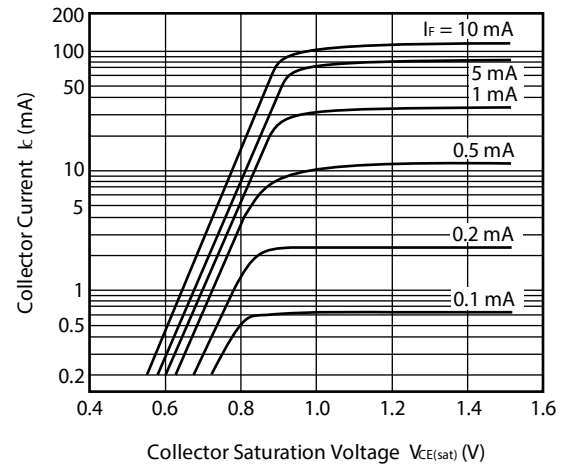
COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE



COLLECTOR TO EMITTER DARK
CURRENT vs. AMBIENT TEMPERATURE

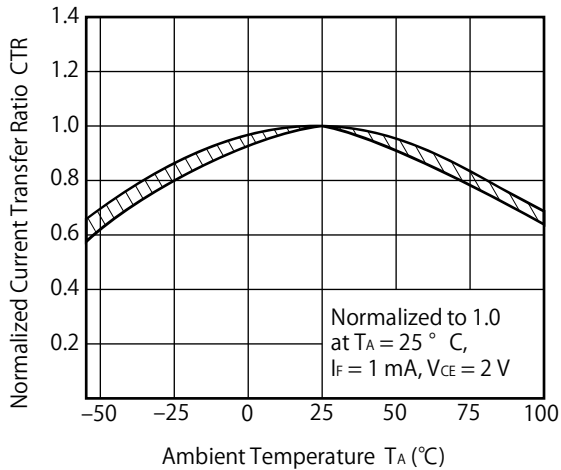


COLLECTOR CURRENT vs.
COLLECTOR SATURATION VOLTAGE

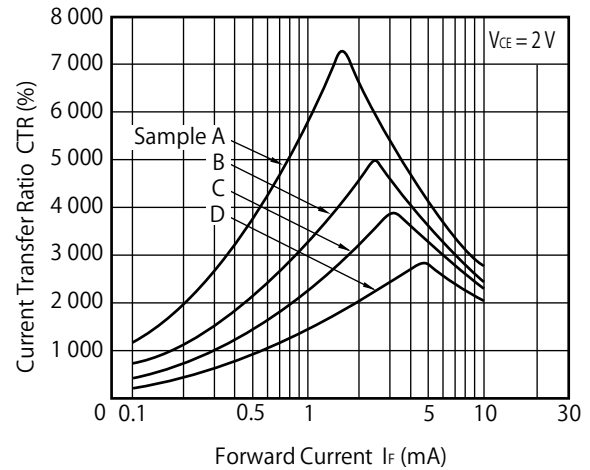


Remark The graphs indicate nominal characteristics.

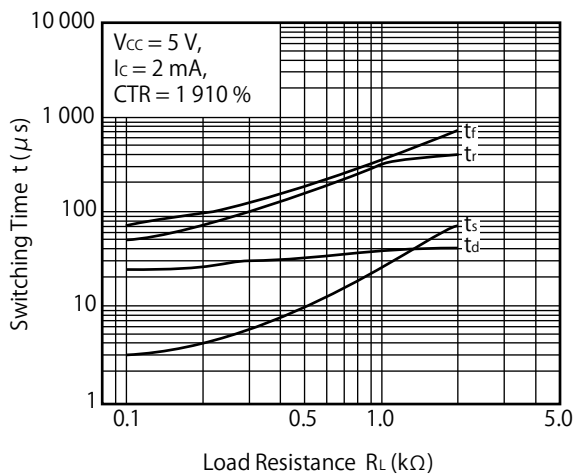
NORMALIZED CURRENT TRANSFER RATIO vs. AMBIENT TEMPERATURE



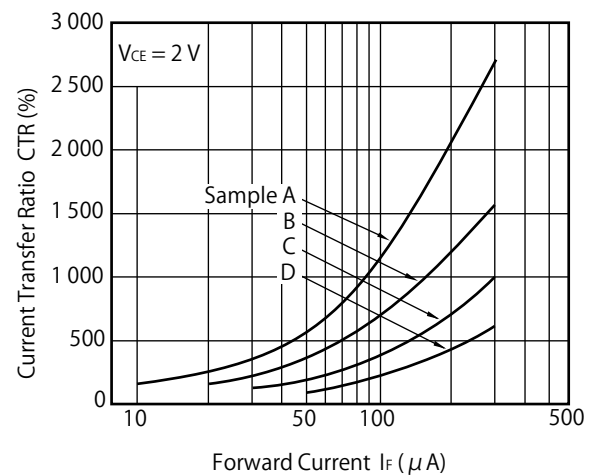
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



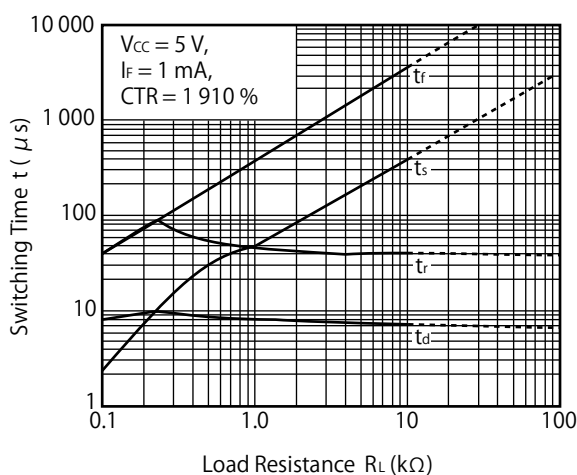
SWITCHING TIME vs. LOAD RESISTANCE



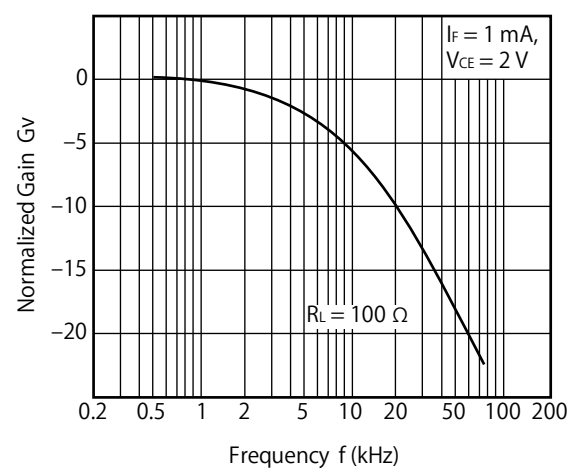
CURRENT TRANSFER RATIO vs. FORWARD CURRENT



SWITCHING TIME vs. LOAD RESISTANCE



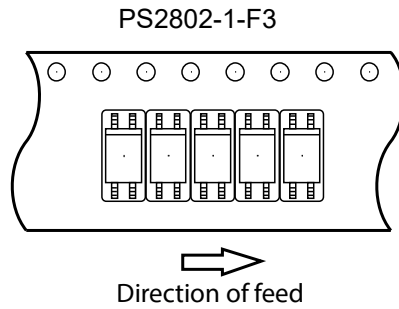
FREQUENCY RESPONSE



Remark The graphs indicate nominal characteristics.

TAPING SPECIFICATIONS (UNIT: mm)

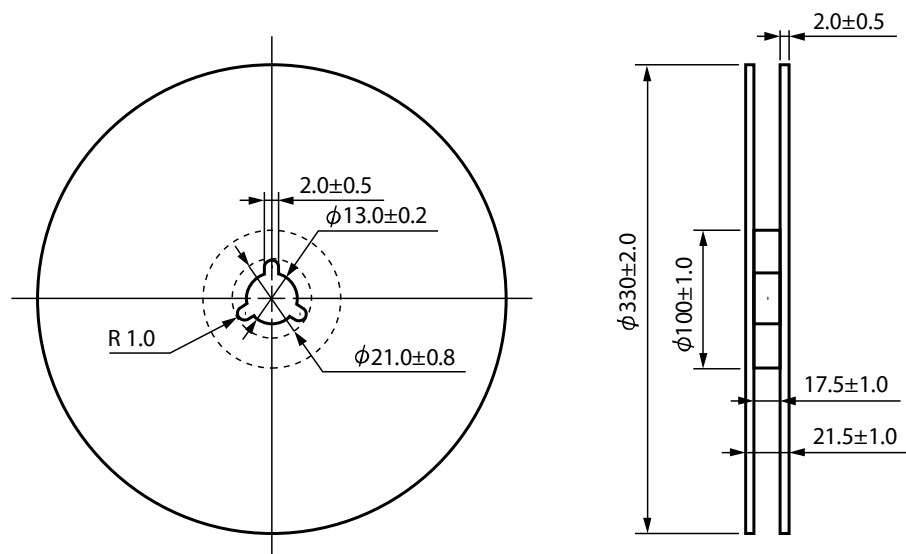
Tape Direction



Outline and Dimensions (Tape)

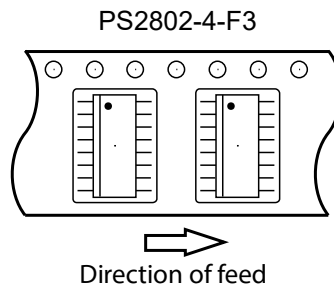


Outline and Dimensions (Reel)



Packing: 3 500 pcs/reel

Tape Direction



Outline and Dimensions (Tape)

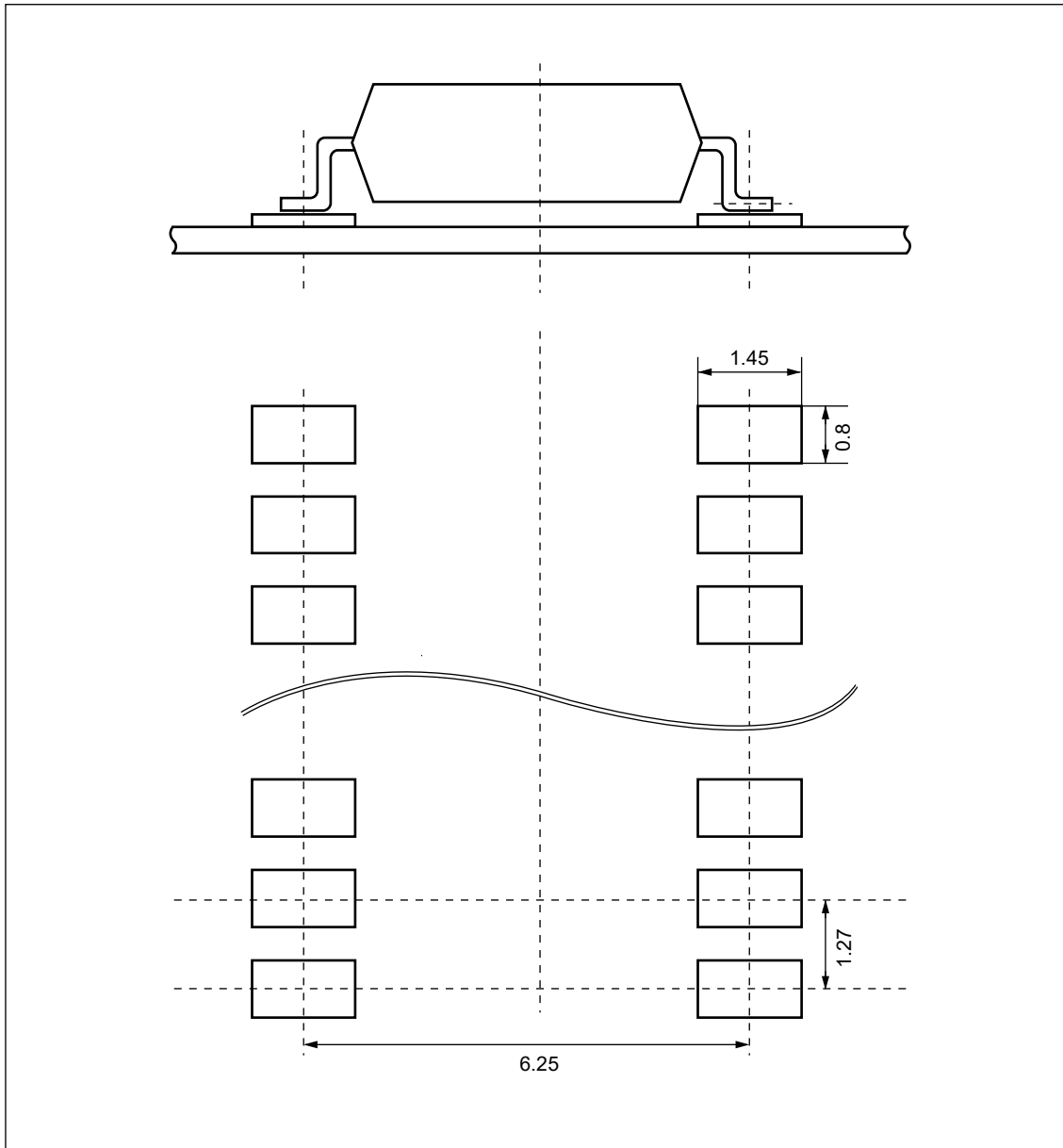


Outline and Dimensions (Reel)



Packing: 2 500 pcs/reel

RECOMMENDED MOUNT PAD DIMENSIONS (UNIT: mm)



Remark All dimensions in this figure must be evaluated before use.

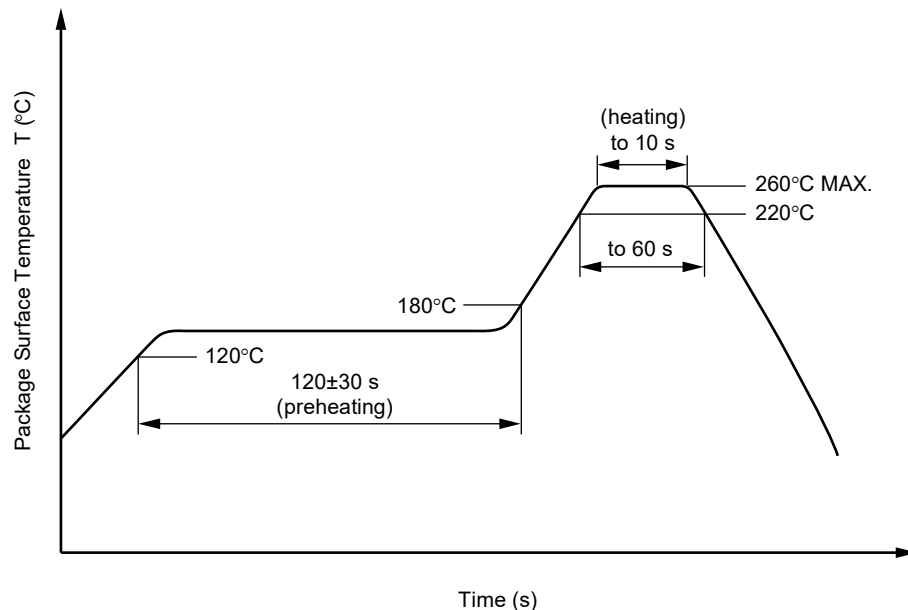
NOTES ON HANDLING

1. Recommended soldering conditions

(1) Infrared reflow soldering

- Peak reflow temperature 260°C or below (package surface temperature)
- Time of peak reflow temperature 10 seconds or less
- Time of temperature higher than 220°C 60 seconds or less
- Time to preheat temperature from 120 to 180°C 120±30 s
- Number of reflows Three
- Flux Rosin flux containing small amount of chlorine
(The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

Recommended Temperature Profile of Infrared Reflow



(2) Wave soldering

- Temperature 260°C or below (molten solder temperature)
- Time 10 seconds or less
- Preheating conditions 120°C or below (package surface temperature)
- Number of times One (Allowed to be dipped in solder including plastic mold portion.)
- Flux Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(3) Soldering by Soldering Iron

- Peak Temperature (lead part temperature) 350°C or below
- Time (each pins) 3 seconds or less
- Flux Rosin flux containing small amount of chlorine
(The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(a) Soldering of leads should be made at the point 1.5 to 2.0 mm from the root of the lead

(b) Please be sure that the temperature of the package would not be heated over 100°C

(4) Cautions

- Flux Cleaning
Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.
- Do not use fixing agents or coatings containing halogen-based substances.

2. Cautions regarding noise

Be aware that when voltage is applied suddenly between the photocoupler's input and output or between collector-emitters at startup, the output transistor may enter the on state, even if the voltage is within the absolute maximum ratings.

3. Measurement conditions of current transfer ratios (CTR), which differ according to photocoupler

Check the setting values before use, since the forward current conditions at CTR measurement differ according to product.

When using products other than at the specified forward current, the characteristics curves may differ from the standard curves due to CTR value variations or the like. This tendency may sometimes be obvious, especially below $I_F = 1 \text{ mA}$.

Therefore, check the characteristics under the actual operating conditions and thoroughly take variations or the like into consideration before use.

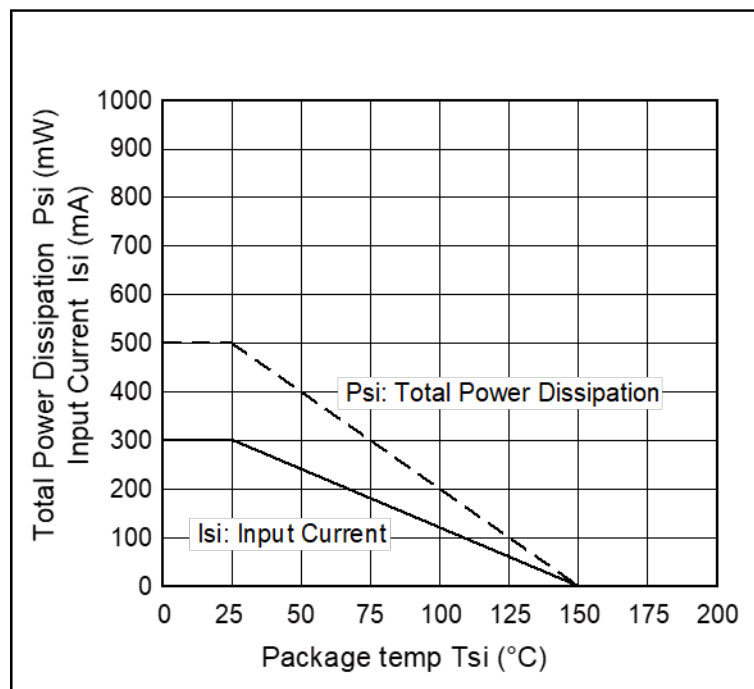
USAGE CAUTIONS

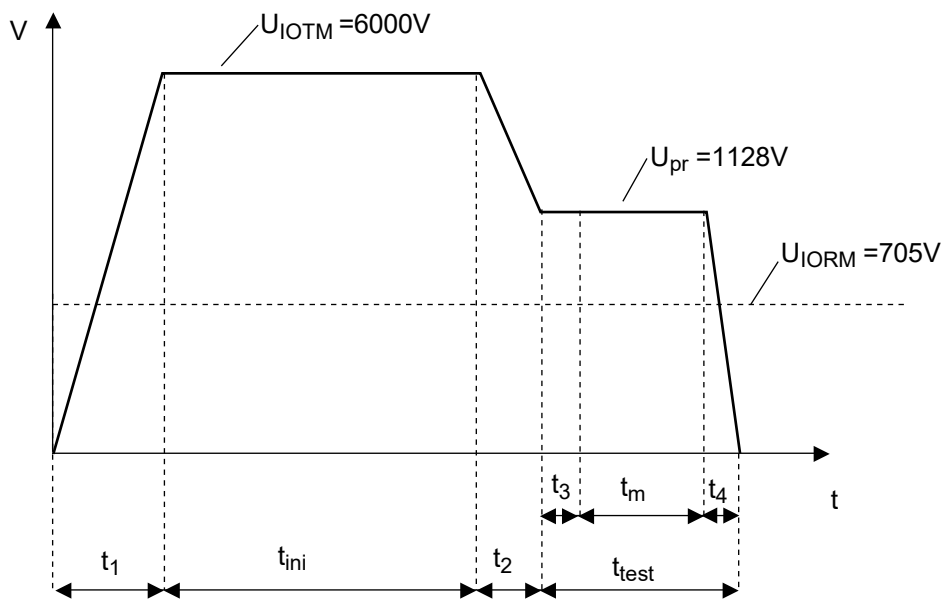
1. Protect against static electricity when handling.
2. Avoid storage at a high temperature and high humidity.
3. Avoid cleaning with Freon based or halogen-based (chlorinated etc.) solvents.
4. Do not use fixing agents or coatings containing halogen-based substances.

SPECIFICATION OF VDE MARKS LICENSE DOCUMENT

Parameter	Symbol	Rating	Unit
Climatic test class (IEC 60068-1/DIN EN 60068-1)		55/100/21	
Dielectric strength maximum operating isolation voltage Test voltage (partial discharge test, procedure a for type test and random test) $U_{pr} = 1.6 \times U_{IORM}$, $P_d < 5 \text{ pC}$	U_{IORM} U_{pr}	705 1 128	V_{peak} V_{peak}
Test voltage (partial discharge test, procedure b for all devices) $U_{pr} = 1.875 \times U_{IORM}$, $P_d < 5 \text{ pC}$	U_{pr}	1 322	V_{peak}
Highest permissible overvoltage	U_{IOTM}	6 000	V_{peak}
Degree of pollution (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1))		2	
Comparative tracking index (IEC 60112/DIN EN 60112 (VDE 0303-11))	CTI	175	
Material group (IEC 60664-1/DIN EN 60664-1 (VDE 0110-1))		III a	
Storage temperature range	T_{stg}	-55 to +150	°C
Operating temperature range	T_A	-55 to +100	°C
Isolation resistance, minimum value $V_{IO} = 500 \text{ V dc}$ at $T_A = 25^\circ\text{C}$ $V_{IO} = 500 \text{ V dc}$ at $T_A \text{ MAX.}$ at least 100°C	$R_{is \text{ MIN.}}$ $R_{is \text{ MIN.}}$	10^{12} 10^{11}	Ω Ω
Safety maximum ratings (maximum permissible in case of fault, see thermal derating curve) Package temperature Current (input current I_F , $\Psi_i = 0$) Power (output or total power dissipation) Isolation resistance $V_{IO} = 500 \text{ V dc}$ at $T_A = T_{si}$	T_{si} I_{si} Ψ_i $R_{is \text{ MIN.}}$	150 300 500 10^9	°C mA mW Ω

Dependence of maximum safety ratings with package temperature



Method a) Destructive Test, Type and Sample Test

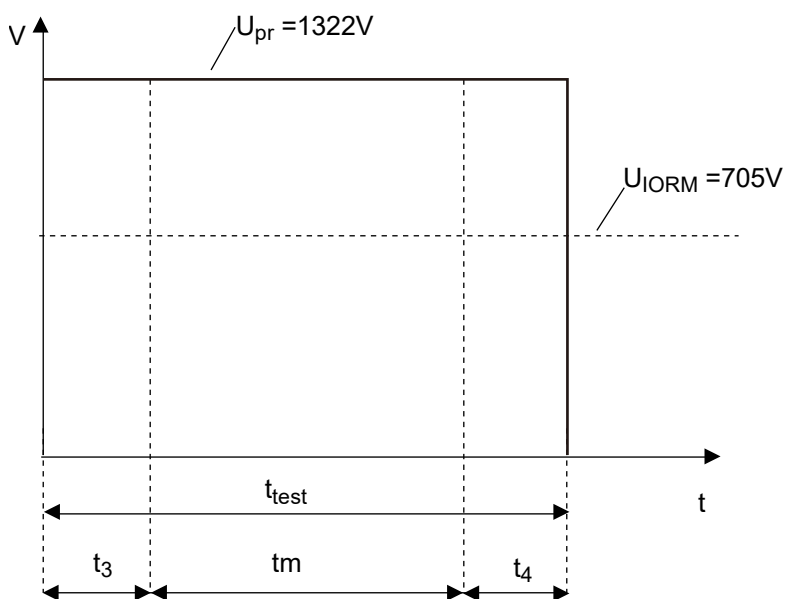
$t_1, t_2 = 1$ to 10 sec

$t_3, t_4 = 1$ sec

$t_m(\text{PARTIAL DISCHARGE}) = 10$ sec

$t_{test} = 12$ sec

$t_{ini} = 60$ sec

Method b) Non-destructive Test, 100% Production Test

$t_3, t_4 = 0.1$ sec

$t_m(\text{PARTIAL DISCHARGE}) = 1.0$ sec

$t_{test} = 1.2$ sec

Caution

GaAs Products

This product uses gallium arsenide (GaAs).

GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points.

- Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below.
 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials.
 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal.
- Do not burn, destroy, cut, crush, or chemically dissolve the product.
- Do not lick the product or in any way allow it to enter the mouth.

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